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Research Article

A Study of Drug Utilization and Prescribing Patterns of Drugs in Chronic Obstructive Pulmonary Diseased Patients (IPD and OPD) in Tertiary Care Hospital

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Abstract

Chronic Obstructive Pulmonary Disease is a heterogeneous disease with various clinical presentations. It is a multicomponent disease with extra-pulmonary effects. The study was carried out to assess drug use and prescribing pattern by various medical practitioners in COPD patients with or without co-morbidity. The study was conducted at MMIMSR. In our prospective study analysis, a total of 80 COPD patients were selected randomly. Out of which, 20 patients were excluded from the study on the basis of the exclusion criteria, and remaining 60 patients fulfilling inclusion criteria were included. Among the total number of patients, Bi-therapy was prescribed predominantly (55%), followed by tritherapy (37%), least number of patients was prescribed monotherapy (8%) showed in table 6. The COPD patients included in the study were prescribed medications by various Medical Practitioners (A, B, C) among which, 28% patients were prescribed medications by A, 33% by B and 39% by C, In conclusion, maximum improvement in the symptoms of disease (CAT score) was found out with Bi-therapy (combination of Sympathomimetics and Xanthene derivatives), the Quality of life (SF36 Questionnaire score) seems to be improved with Bi-therapy (Combination of Anticholinergics and Xanthene derivatives) also, the severity of disease (Dyspnea score) found to be improved with Bi-therapy (Combination of Anticholinergics and Xanthene derivatives). Also, most of the Medical practitioners prescribed majorly Bi-therapy in COPD patients.

Keywords: Drug Utilization; COPD; Prescribing Pattern; Drugs; Tertiary Care

Abbreviations

ALD: Alcoholic Liver Disease; AAT: Alpha-1-Antitrypsin; Bi: Bi Therapy; CAD: Coronary Artery Disease; CAT: COPD Assessment Test; CCF: Congestive Cardiac Failure; COPD: Chronic Obstructive Pulmonary Disease; CKD: Chronic Kidney Disease; DCMP: Dilated Cardio Myopathy; DUR: Drug Utilization Review; SF36: Short Form 36; HBsAg: Hepatitis B Virus Surface Antigen; HCV: Hepatitis C Virus; IPD: In Patient Department; Mono: Mono Therapy; NPPV: Non-invasive Positive Pressure Ventilation; OPD: Out Patient Department; SEM: Standard Error of Mean; Tri: Tri therapy; UTI: Urinary Tract Infection; WHO: World Health Organization.

Introduction

Chronic Obstructive Pulmonary Disease is a heterogeneous disease with various clinical presentations. It is a multicomponent disease with extra-pulmonary effects. It is a major problem of public health in subjects above 40 years of age and it will remain a major challenge for the future. It is one of the major causes of chronic worldwide morbidity and mortality. The limitation of airflow is progressive usually and is associated with an abnormal inflammatory response of the lungs in response to triggering agents that includes biomass fuels, occupational agents and cigarette smoke. The chronic limitation in the airflow is a characteristic of COPD which is caused by a combination of chronic bronchitis and emphysema i.e. destruction of parenchyma [1]. The basic abnormality in COPD patients is limitation in the airflow [2]. The two most common conditions contributing to COPD are chronic bronchitis and emphysema. Chronic bronchitis is inflammation of the lining of the bronchial tubes, which carry air to and from the air sacs (alveoli) of the lungs. It is characterized by daily cough and sputum production. Emphysema is a condition in which the air sacs (alveoli) at the end of the smallest air passages (bronchioles) of the lungs are destroyed as a result of damaging exposure [3]. Permanent enlargement of the airspaces distal to the terminal bronchioles, accompanied by destruction of their walls without obvious fibrosis. Chronic productive cough for three months in each of two consecu-

tive years in a patient in whom other causes of productive chronic cough have been excluded [4]. It is preventable and treatable disease state characterized by airflow limitation that is not fully reversible. Other symptoms include breathing difficulty, cough, sputum production and wheezing. It's caused by long-term exposure to irritating gases or particulate matter, most often from cigarette smoke. People with COPD are at increased risk of developing heart disease, lung cancer and a variety of other conditions [4]. However, a recent critical analysis of methods to estimate projections of the burden of diseases, by using extrapolation or by using risk factors, has called attention to the difficulties in having a precise definition of global trends on COPD burden [3].

There are numbers of factors that cause COPD:

- Smoking: cigarette smoking and tobacco is one of the most leading causes COPD all over the world. As it contains various carcinogenic agents and toxins which induce inflammation at mucosal surface of the lungs and bronchial tracks.
- Genetic disorder known as alpha-1antitrypsin deficiency is the only genetic cause for the COPD leading to premature emphysema and development of the disease in the non smoker patients.
- Passive smoke may also damage the lungs.
- Inhaling chemical fumes, air pollution, or dust for a long time [5].

COPD is a complex syndrome comprised of airway inflammation, mucociliary dysfunction and consequent airway structural changes. It is characterized by chronic inflammation of the airways, lung tissue and pulmonary blood vessels as a result of exposure to inhaled irritants such as tobacco smoke. The inhaled irritants cause inflammatory cells such as neutrophils, CD8+ T-lymphocytes. Airway remodeling in COPD is a direct result of the inflammatory response associated with COPD and leads to narrowing of the airways. Parenchymal destruction is associated with loss of lung tissue elasticity, which occurs as a result of destruction of the structures supporting and feeding the alveoli causes emphysema. Smoking and inflammation enlarge the mucous glands that line airway walls in the lungs, causing goblet cell metaplasia and leading to healthy cells being replaced by more mucus-secreting cells [6].

Clinicians and researchers have shown a rational attitude towards the treatment and management of COPD for many years. Over 47 years ago, the only therapies that were given for COPD were antibiotics for pneumonia, potassium iodide used as a mucuolytic agent, products with combination including a small amount of theophylline, a minor amount of sedative, and ephedrine. In early 1960s, use of Inhalational isoproterenol was started [7]. In the beginning of 1960s, use of mechanical ventilators for the management of acute respiratory failure was started to save the patients with COPD [8]. In the first Denver studies of ambulatory oxygen was used in patients with stable hypoxemia (chronic) which showed huge reductions in erythrocytosis and pulmonary hypertension, along with a huge increase in tolerance of exercise [9]. Design of the Nocturnal Oxygen Therapy was a result of many early pilot studies for symptomatic treatment for COPD.

The aim of this study is to carry out a detailed comparison of these guidelines, prescribing pattern and drug utilization by medical practitioners to improve the clinical symptoms in COPD patients and their quality of life.

Research Methodology

Study design

A prospective study was carried out to find out the utilization and prescribing pattern of drugs by various medical practitioners in COPD patients with or without co-morbidity.

Place of study

Maharishi Markandeshwar Institute of Medical Science and Research hospital (MMIMSR). MMIMSR is a multi-specialty teaching hospital Mullana (Ambala), Haryana. It is 850-bedded hospital.

Study approach

The presented study was conducted by collecting the various COPD cases from the Medicine department of MMIMSR Hospital, Mullana (Ambala), Haryana.

Study period

Study period was 6 months commencing from October 2015 to April 2016.

Sample size

In the present Study, Sample size consisted of (N = 60) of COPD patients (Inpatients/Outpatients), that were observed in the hospital.

Inclusion criteria

The patients should be:

- Diagnosed with COPD with or without concomitant illness.
- Having CAT score above 25.
- Patients of both genders.
- Patients having COPD with age 21 - 79 years.

Exclusion criteria

Patients with the following were excluded from the study:

- Pediatric population
- Pregnant and lactating women
- Patients having COPD with age less than 20 years and more than 80 years.
- Tuberculosis
- Other upper and lower respiratory infections.

Data collection

Data was collected by using following forms

- A detailed clinical history of patient in Patient Case Format (Annex 1)
- Assessment Functional Dyspnea Scale (Annex 2)
- COPD assessment Test (CAT) form (Annex4)
- SF36 Questionnaire form (Annex 5).

The data collected using patient case form included parameters like age, sex, co-morbidity, medications prescribed (name of drug, dosage, route of administration etc.), smoking habits (reformed/ currently smoking), duration of therapy.

Analysis of data

Analysis involved percentage and descriptive statistics like mean, standard deviation by mean and frequency distributions.

Research variables

Data on the following variables were collected:

Socio-demographic Factors:

- Age
- Sex
- Co morbidity
- Smoking habit.

Prescribing patterns

- COPD drugs
- Drug therapy (Mono therapy, Bi therapy, Triple therapy).

Expected outputs

- Utilization of drugs
- Prescribing patterns.

Ethical Consideration

Permission and approval for the research (Project no.673) was sought from the MMIMSR Ethics Committee. The study participants were informed verbally and in writing about the purpose of the proposed study. Informed consent was obtained from the participants before including him/her in the study.

Result

The study was carried out to assess drug use and prescribing pattern by various medical practitioners in COPD patients with or without co-morbidity. The study was conducted at MMIMSR. In our prospective study analysis, a total of 80 COPD patients were selected randomly. Out of which, 20 patients were excluded from the study on the basis of the exclusion criteria, and remaining 60 patients fulfilling inclusion criteria were included. Hence the result was based on the data of 60 patients.

Gender	No. of patients	Percentage of patients
Male	38	37%
Female	22	63%
Total	60	100%

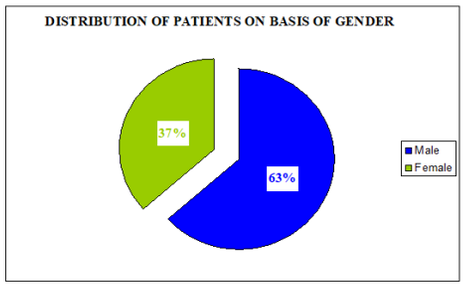

Table 1: Distribution of COPD patients on basis of gender.

Age	No. of Patients	Percentage of Patients
20 - 30 years	00	0%
30 - 45 years	07	12%
45 - 60 years	21	35%
60 - 80 years	32	53%

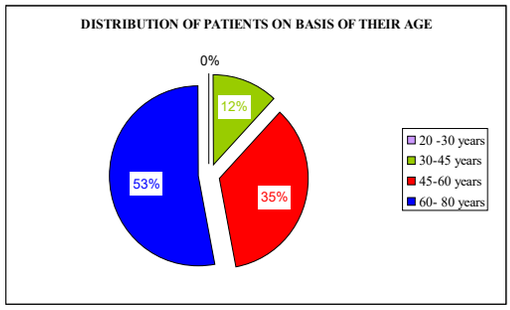

Table 2: Distribution of COPD patients on basis of age.

Types	No. of Patients	Percentage of Patients
Smoker	52	87%
Non Smoker	08	13%

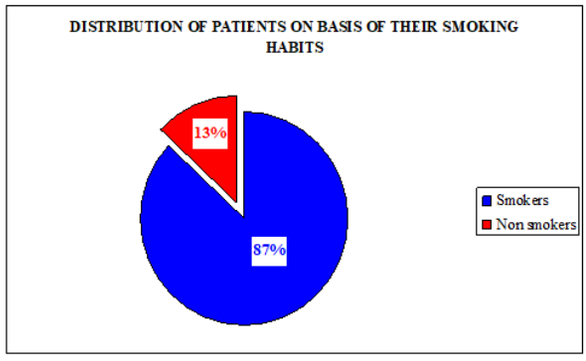

Table 3: Distribution of the patients based on smoking habit.

Co-Morbid Condition	No. of Patients	Percentage of Patients
Hypertension	06	10%
Diabetes mellitus	02	3%
Cor-Pulmonale	09	15%
UTI	01	2%
CAD	05	8.%
Alcoholic hepatitis	02	3%
CKD	02	3%
ALD	01	2%
Acute exacerbations	16	27%
HCV	02	3%
Cervical spondylosis	01	2%
Renal Calculi	02	3%
Hypothyroidism	01	2%
Epistaxis	02	3%
CCF	02	3%
DCMP	02	3%
Rheumatic arthritis	01	2%
Myocardial infarction	01	2%
Cholelithiasis	01	2%
HbsAg	01	2%

Table 4: Distribution of patients based on co-morbid condition with COPD.

Medications	No. of Patients	Percentage of Patients
Sympathomimetics		
Salbutamol	09	15%
Formoterol	08	13%
Terbutaline	23	38%
Anticholinergics		
Ipratropium Bromide	07	12%
Xanthene Derivatives		
Theophylline	12	20%
Doxofylline	04	7%
Acebrophylline	20	33%
Sympathomimetics/Glucococorticoids		
Formoterol + Budesonide	05	8%
Sympathomimetics/Anticholinergics		
Salbutamol+ Ipratropium Bromide	41	68%
Inhaled Glucococorticoids		
Budesonide	46	77%
Parenteral Glucococorticoids		
Hydrocortisone	21	35%
Oral Glucocorticoids		
Prednisolone	03	5%
Methylprednisolone	04	7%
Leukotrine Modifiers		
Montelukast	05	8%
Leukotrine Modifiers/Antihistamines		
Montelukast + Levocetirizine	04	7%
Phosphodiesterase-4 Enzyme Inhibitor		
Roflumilast	02	3%
Mucolytics		
Acetylcystine	11	18%
Antibiotics		
Azithromycin	15	25%
Cefixime	05	8%
Cefixime + Azithromycin	05	8%
Levofloxacin	06	10%
Ceftriaxone	22	37%
Amoxicillin + Clavulanic Acid	03	5%

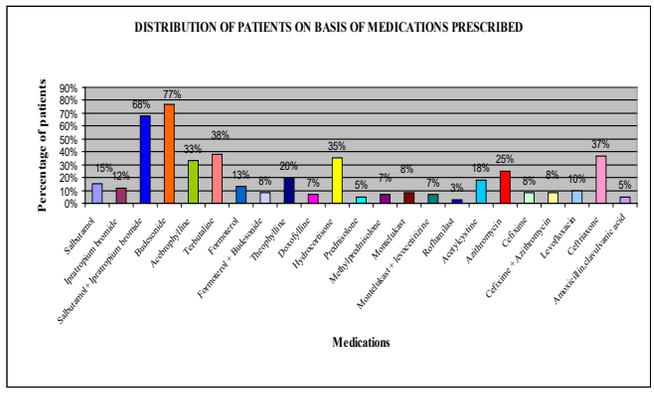

Table 5: Categorization of patients on basis of medications prescribed for COPD.

Drug therapy	No. of Patients	Percentage of Patients
Mono therapy	05	8%
Double therapy	33	55%
Triple therapy	22	37%

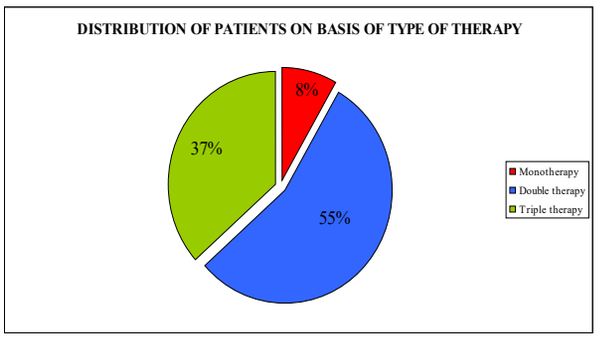

Table 6: Distribution of patients on basis of type of therapy prescribed for COPD.

Prescriber	No. of patients	Percentage of patients
A	17	28%
B	20	33%
C	23	39%

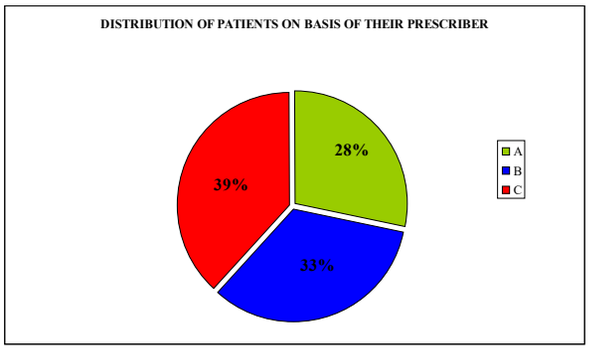

Table 7: Distribution of patients on basis of their medical prescriber.

Medical practitioners	Therapy	Percentage of patients
A	Mono	2%
	Bi	17%
	Tri	10%
B	Mono	2%
	Bi	23%
	Tri	8%
C	Mono	5%
	Bi	15%
	Tri	18%

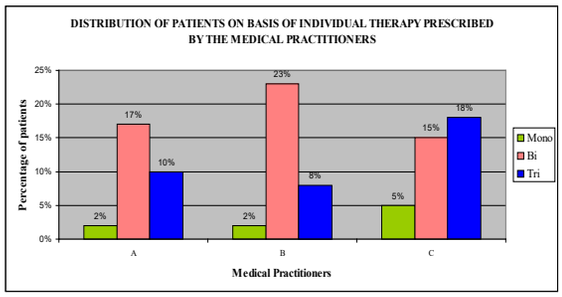

Table 8: Distribution of patients on basis of individual therapy prescribed by the medical practitioners.

Therapy	CAT Score (%)	CAT Score (%)	CAT Score (%)	CAT Score (%)
	0 - 10	10 - 20	20 - 30	30 - 40
Mono	0%	0%	2%	7%
Bi	0%	0%	15%	40%
Tri	0%	0%	11%	25%

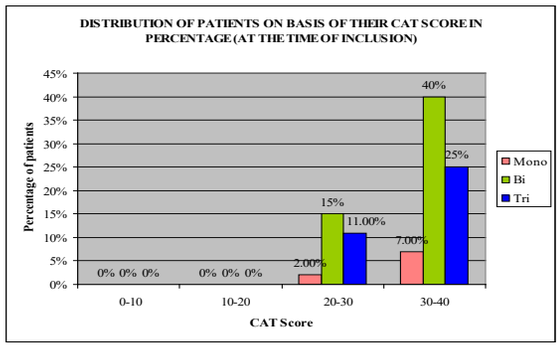

Table 9: Distribution of the patients based on cat score in percentage (at the time of inclusion).

Therapy	SF36 score (%)	SF36 score (%)	SF36 score (%)	SF36 score (%)	SF36 score (%)
	0 - 30	30 - 60	60 - 90	90 - 120	120 - 150
Mono	0%	0%	7%	2%	0%
Bi	0%	2%	42%	10%	0%
Tri	0%	5%	30%	2%	0%

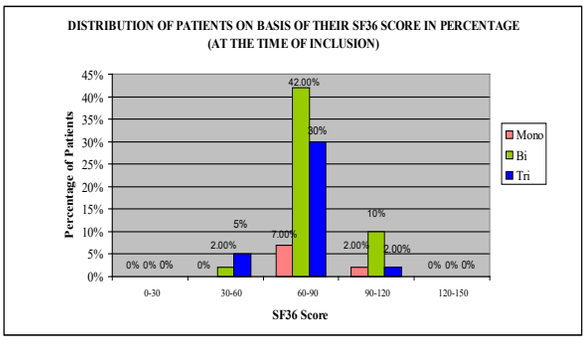

Table 10: Distribution of the patients based on sf36 questionnaire score in percentage (at the time of inclusion).

Therapy	Dyspnea score (%)	Dyspnea score (%)	Dyspnea score (%)	Dyspnea score (%)	Dyspnea score (%)
	0	1	2	3	4
Mono	0%	0%	0%	5%	3%
Bi	0%	0%	2%	23%	30%
Tri	0%	0%	0%	12%	25%

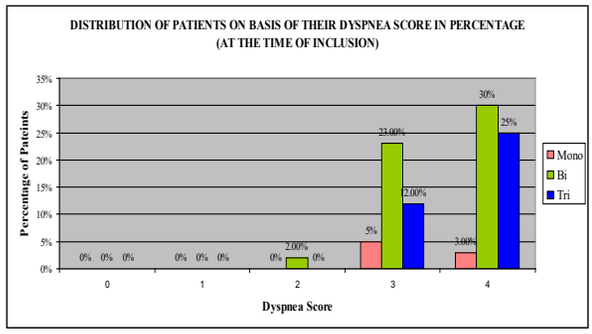

Table 11: Distribution of the patients based on dyspnea score in percentage (at the time of inclusion).

Therapy	Medication	CAT score (at time of inclusion)	CAT score after 2 wks	% Improvement after 2 wks	CAT score after 4 wks	% Improvement after 4 wks
Mono	Sympathomimetics	29.5 ± 0.5	14.5 ± 5.5	50.85*	11.5 ± 4.5	61.02*
	Anticholinergics	-	-	-	-	-
	Xanthene derivatives	31.67 ± 0.34	18 ± 1.7	43.16*	12 ± 2.5	62.11*

Table 12: Improvement in cat score with mono therapy. Results are expressed as mean ± SEM; * p<0.05

Therapy	Medication	SF36 score (at time of inclusion)	SF36 score after 2 wks	% Improvement after 2 wks	SF36 score after 4 wks	% Improvement after 4 wks
Mono	Sympathomimetics	87 ± 2	96.5 ± 7.5	10.91	111.5 ± 5.5	28.16*
	Anticholinergics	-	-	-	-	-
	Xanthene derivatives	84 ± 3.5	113 ± 9.5	34.52*	126.34 ± 7.7	50.40*

Table 13: Improvement in SF36 score with mono therapy. Results are expressed as mean ± SEM; *p<0.05.

Therapy	Medication	Dyspnea score (at time of inclusion)	Dyspnea score after 2 wks	% Improvement after 2 wks	Dyspnea score after 4 wks	% Improvement after 4 wks
Mono	Sympathomimetics	3 ± 0	2 ± 0	33.34	1 ± 0	66.67*
	Anticholinergics	-	-	-	-	-
	Xanthene derivatives	3.67 ± 0.4	2 ± 0	45.5*	1.34 ± 0.34	63.49*

Table 14: Improvement in dyspnea score with mono therapy. Results are expressed as mean ± SEM; * p<0.05.

Therapy	Medication	CAT score (at time of inclusion)	CAT score after 2 wks	% Improvement after 2 wks	CAT score after 4 wks	% Improvement after 4 wks
Bi-therapy	Sympathomimetics + Anticholinergics	32 ± 0.76	16.04 ± 0.69	49.87	10.8 ± 0.63	66.25*
	Anticholinergics + Xanthene derivatives	32 ± 4	19 ± 1	40.62	10.5 ± 2.5	62.19*
	Sympathomimetics + Xanthene derivatives	34 ± 1.54	14.5 ± 0.85	57.35*	8.34 ± 0.92	75.47*

Table 15: Improvement in cat score with bi therapy. Results are expressed as mean ± SEM; * p<0.05

Therapy	Medication	SF36 score (at time of inclusion)	SF36 score after 2 wks	% Improvement after 2 wks	SF36 score after 4 wks	% Improvement after 4 wks
Bi-therapy	Sympathomimetics + Anticholinergics	81.56 ± 2.4	103.3 ± 2.15	26.65	120.2 ± 1.99	47.38*
	Anticholinergics + Xanthene derivatives	79.5 ± 9.5	122 ± 8	54.56*	138.5 ± 3.5	74.21*
	Sympathomimetics + Xanthene derivatives	86.17 ± 1.7	95.34 ± 1.38	10.64	115.17 ± 4.5	33.65

Table 16: Improvement in sf36 score with bi therapy. Results are expressed as mean ± SEM; *p<0.05

Therapy	Medication	Dyspnea Score (At Time of Inclusion)	Dyspnea Score After 2 Wks	% Improvement After 2 Wks	Dyspnea Score After 4 Wks	% Improvement After 4 Wks
Bi-Therapy	Sympathomimetics + Anticholinergics	3.52 ± 0.1	1.88 ± 0.12	46.59	0.96 ± 0.07	72.72*
	Anticholinergics + Xanthene derivatives	3.5 ± 0.5	1.5 ± 0.5	57.14*	0.5 ± 0.5	85.71*
	Sympathomimetics + Xanthene derivatives	3.5 ± 0.2	2 ± 0.26	42.86	1 ± 0	71.43*

Table 17: Improvement in dyspnea score with bi therapy. Results are expressed as mean ± SEM; * p<0.05

Therapy	Medication	Cat Score (At Time of Inclusion)	Cat Score After 2 Wks	% Improvement After 2 Wks	Cat Score After 4 Wks	% Improvement After 4 Wks
Tri-Therapy	Sympathomimetics + Anticholinergics + Xanthene derivatives	31.14 ± 0.7	14.81 ± 0.8	52.44*	9.5 ± 0.8	69.49*

Table 18: Improvement in cat score with tri therapy. Results are expressed as mean ± SEM; *p < 0.05.

Therapy	Medication	SF36 score (at time of inclusion)	SF36 score after 2 wks	% Improvement after 2 wks	SF36 score after 4 wks	% Improvement after 4 wks
Tri	Sympathomimetics + Anticholinergics + Xanthene derivatives	79.18 ± 2.3	102.68 ± 1.8	29.68	118.31 ± 2.1	49.29*

Table 19: Improvement in SF36 score with tri therapy. Results are expressed as mean ± SEM; *p < 0.05.

Therapy	Medication	Dyspnea score (at time of inclusion)	Dyspnea score after 2 wks	% Improvement after 2 wks	Dyspnea score after 4 wks	% Improvement after 4 wks
Tri	Sympathomimetics + Anticholinergics + Xanthene derivatives	3.68 ± 0.1	1.95 ± 0.1	47.01*	0.86±0.09	73.05*

Table 20: Improvement in dyspnea score with tri therapy. Results are expressed as mean ± SEM; *p < 0.05.

Medications	Percentage of patients	CAT score (%)	SF36 score (%)	Dyspnea score (%)
Sympathomimetics				
Salbutamol	15%	73*	34	74*
Formoterol	13%	62*	46	71*
Terbutaline	38%	69*	41	75*
Anticholinergics				
Ipratropium bromide	12%	66*	47	74*
Xanthene Derivatives				
Theophylline	20%	70*	43	75*
Doxofylline	7%	73*	33	73*
Acebrophylline	33%	68*	48	77*
Combinations				
Formoterol + Budesonide	8%	67*	58*	78*
Salbutamol + Ipratropium bromide	68%	67*	48	74*

Table 21: Improvement in different parameters after 4 weeks with individual/combination medications.

Discussion

The demographic characteristic of the study sample of (N=60) COPD patients indicated that the male population were found to be predominantly having COPD (63%) when compared to female population which is only (37%) as shown in table 1. The result showed (Table 2) that more number of patients was in between 60 – 80 years (53%), followed by number of patients between 40 - 60 years (35%). Least number of patients was in age group between 20 – 40 years (12%) as shown in the. Among the total number of COPD patients included in the study, the number of smokers was predominantly high (87%) when compared to the non-smokers (13%) (Table 3).

In the study, co-morbidities found with COPD were Cor-Pulmonale (15%), Hypertension (10%), CAD (8%), Diabetes mellitus (3%), Alcoholic hepatitis (3%), CKD (3%), Renal calculi (3%), HCV (3%), Epistaxis (3%), CCF (3%), DCMP (3%), ALD (2%), Cervical spondylosis (2%), UTI (2%), Hypothyroidism (2%), Rheumatic arthritis (2%), Myocardial Infarction (2%), Cholelithiasis (2%), HbsAg (2%) and Acute exacerbation (27%) (Table 4).

During study, the medications predominantly prescribed for COPD were Budesonide (77%) and marketed combination of Salbutamol and Ipratropium bromide (68%). Other drugs prescribed were Terbutaline (38%), Hydrocortisone (35%), Acebrophylline (33%), Acetylcystine (18%), Salbutamol (15%), formoterol (13%), Ipratropium bromide (12%), Theophylline (12%), Marketed combination of Formoterol and Budesonide (8%), Montelukast (8%), Doxofylline (7%), Methylprednisolone (7%), Marketed combination of montelukast and levocetirizine (7%), Prednisolone (5%), Roflumilast (3%), (Table 5).

Among the total number of patients, Bi-therapy was prescribed predominantly (55%), followed by tritherapy (37%), least number of patients was prescribed monotherapy (8%) showed in table 6. The COPD patients included in the study were prescribed medications by various Medical Practitioners (A, B, C) among which, 28% patients were prescribed medications by A, 33% by B and 39% by C (Table 7).

The Medical Practitioners' prescribed different therapies (monotherapy, Bi-therapy, tritherapy) to individual patients; 'A' prescribed majorly Bi-therapy to 17% patients, tritherapy to 10% patients, and monotherapy to 2% patients. 'B' prescribed majorly Bi-therapy to 23%, tritherapy to 8% patients and monotherapy to 2% patients. 'C' prescribed majorly tritherapy to 18% patients, Bi-therapy to 15% patients and monotherapy to 5% patients (Table 8).

At the time of inclusion, Percentage of patients having CAT score 20 - 30 receiving Bi-therapy was 15%, tritherapy was 11% and monotherapy was 2%, Percentage of patients having CAT score 30-40 receiving Bi-therapy was 40%, tritherapy was 25%and monotherapy was 7% that is shown in table 9.

At the time of inclusion, percentage of patients having SF36 score 30 - 60 receiving Bi-therapy was 2%, tritherapy was 5%, percentage of patients having SF36 score 60 - 90 receiving monotherapy was 7%, Bi-therapy was 42% and tritherapy was 30%, percentage of patients having SF36 score 90 - 120 receiving monotherapy was 2%, Bi-therapy was 10%, tritherapy was 2% (Table 10).

At the time of inclusion, percentage of patients having Dyspnea score of 2 receiving Bi-therapy was 2%, percentage of patients having Dyspnea score of 3 receiving monotherapy was 5%, Bi-therapy was 23%, tritherapy was 12% and percentage of patients having Dyspnea score of 4 receiving monotherapy was 3%, Bi-therapy was 30% and tritherapy was 25% (Table 11).

In Monotherapy, the maximum improvement in CAT score was with Xanthene derivatives (62.11%) (Table 12). In Bi-therapy, the maximum improvement in CAT score was with the combination of Xanthene derivatives and Sympathomimetics (75.45%) (Table 15). In Tritherapy, the maximum improvement in CAT score with the combination of Sympathomimetics, anticholinergics and xanthene derivatives was 69.49% (Table 18). All maximum improvement results were of statistical significance ($p < 0.05$).

In Monotherapy, the maximum improvement in SF36 score was with Xanthene derivatives i.e. 50.40% (table 13). In Bi-therapy, the maximum improvement in SF36 score was with the combination of Anticholinergics with Xanthene derivatives i.e. 74.21% (Table 16). In Tritherapy, the maximum improvement in SF36 score with the combination of Sympathomimetics, anticholinergics and xanthene derivatives was 49.29% (Table 19). All maximum improvement results were of statistical significance ($p < 0.05$).

In Monotherapy, the maximum improvement in Dyspnea score was with Sympathomimetics i.e. 66.67% (table 14). In Bi-therapy, the maximum improvement in Dyspnea score was with combination of Anticholinergics with Xanthene derivatives was 85.71 (Table 17). In Tritherapy, the maximum improvement in Dyspnea score with the combination of Sympathomimetics, anticholinergics and xanthene derivatives was 73.05% (Table 20). All maximum improvement results were of statistical significance ($p < 0.05$).

The Improvement in various parameters after 4 weeks by using different Medications was also found. Improvement in CAT

score was highest with Salbutamol (73%) followed by Doxofylline (73%), Theophylline (70%), Terbutaline (69%), Acebrophylline (68%), Ipratropium bromide (66%), Formoterol (62%), Marketed formulation combination of Salbutamol and Ipratropium bromide (67%), Formoterol and Budesonide (67%). Improvement in SF36 score was highest with Marketed formulation combination of Formoterol and Budesonide (58%) followed by Acebrophylline (48%), Salbutamol and Ipratropium bromide (48%), Ipratropium Bromide (48%), Formoterol (46%), Theophylline (43%), Terbutaline (41%), Salbutamol (34%), Doxofylline (33%). Highest improvement in Dyspnea score was with Marketed formulation combination of Formoterol and Budesonide (78%), Acebrophylline (77%), Terbutaline (75%), Theophylline (75%), Salbutamol (74%), Ipratropium Bromide (74%), Salbutamol and Ipratropium bromide (74%), Doxofylline (73%), Formoterol (71%) (Table 21).

Conclusion

In conclusion, maximum improvement in the symptoms of disease (CAT score) was found out with Bi-therapy (combination of Sympathomimetics and Xanthene derivatives), the Quality of life (SF36 Questionnaire score) seems to be improved with Bi-therapy (Combination of Anticholinergics and Xanthene derivatives) also, the severity of disease (Dyspnea score) found to be improved with Bi-therapy (Combination of Anticholinergics and Xanthene derivatives). Also, most of the Medical practitioners prescribed majorly Bi-therapy in COPD patients.

Thus, it can be concluded that, Bi-therapy (combination of Sympathomimetics and Xanthene derivatives or Combination of Anticholinergics and Xanthene derivatives) was most efficient therapy to improve clinical symptoms and quality of life of patient.

Also, combination of Salbutamol and Acebrophylline along with inhaled Budesonide seems to produce a comparatively better effect than other individual/combination medications.

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